# Technology Evaluation Cycles and Maturity Assessment

Multi-Dimensional Assessment of
Technology Maturity Workshop
Organized by AFRL, Wright Patterson AFB, OH

***May 9-11, 2006***

**Presented by:**
**Has Patel**
**Infologic, Inc.**
**has.patel@infologic.com**
**(888) 325 0500 Ext. 100**

# Report Documentation Page

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# Agenda

I. Role of Technology Cycles (Hype Cycle and Adoption Cycles ) in identifying technologies for a System or Project

II. Introduce a methodology, called TechIP (Technology Insertion Plan) which can be used through the complete life cycle of a System or Project to identify, select, insert, integrate and manage technologies.

- tManager (Technology Manager)
- iManager (Insertion and Integration Manager)
- pManager (Plan Manager)



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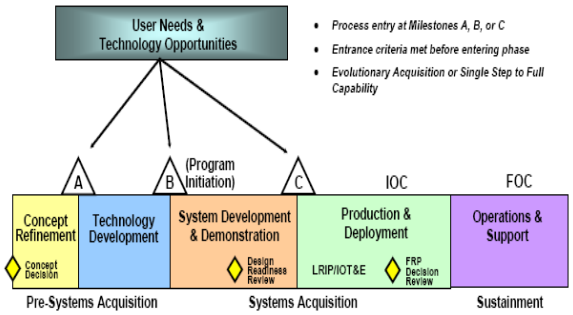
# Strategic Issues: Policy Guidelines

Technology Identification, Due Diligence, Risk Management, Insertion, Integration, Collaboration and Planning processes are **on-going,** and **cover complete life cycle** of a System-of-Systems (SoS) or System.

Figure 1. The Defense Acquisition Management Framework.




***DoDI 5000.2 states that ….***

*" …. The purpose is …. to reduce technology risk and to determine appropriate set of technologies to be integrated into a full system. Technology Development is a continuous technology discovery and development process reflecting close collaboration between the S&T community, the user, and the system developer. It is an iterative process designed to assess the viability of technologies while simultaneously refining user requirements". In addition, it states that ….*

*"…. Technologists and industry shall identify and protect promising technologies in laboratories and research centers, academia, and foreign and domestic sources; reduce the risks of introducing these technologies into the acquisition process; and promote coordination, cooperation and mutual understanding of technology issues…."*



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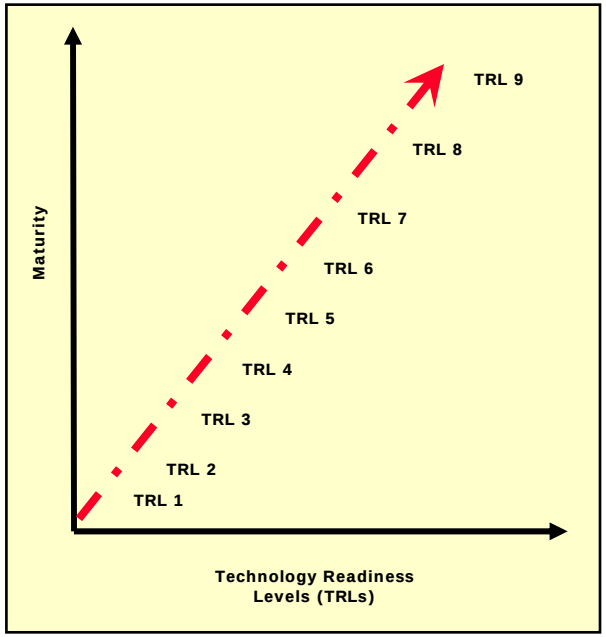
# Strategic Issues: The Pitfalls

## Current practices (e.g.: TRA/TRLs) lack:




- Do not address complete life cycle.
- Single Dimension (**subject of this workshop**)
- Lack of a collaboration platform that can be used by the executive management through technology developers, systems designers and the end users to evaluate, select and implement technologies.
- Does not provide links to related methodologies, such as the SEI Capability Maturity Model (CMM), and the DoDI 5000.2 references to the Evolutionary Acquisition (EA), and Spiral Development (SD) requirements.
- Addresses only “system” technologies (hardware, software, etc.), and does not address “process” technologies (algorithms, formulas, models, methodologies, work flow, etc.)
- TRA/TRLs are based on the government experiences and do not consider industry “best practices”, such as the Gartner Group’s “Technology Hype Cycle”, and the Forrester Group’s “Innovation Network”.



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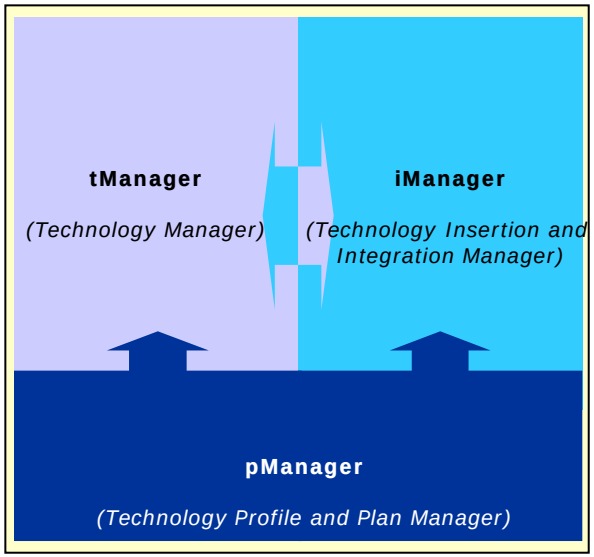
# Strategic Issues: A Solution

TechIP Methodology consists of two models, tManager & iManager, and associated tools, called pManager




- To implement a comprehensive technology insertion and risk management solution which addresses the DoDI 5000.2 requirements and the TRA/TRL shortcomings, what is needed is ……

**A methodology and associated tools that can be used to identify technologies, perform technology due diligence, risk assessment, technology insertion and integration activities for the full life cycle of a SoS or System.**

- **TechIP** (Technology Insertion Plan)



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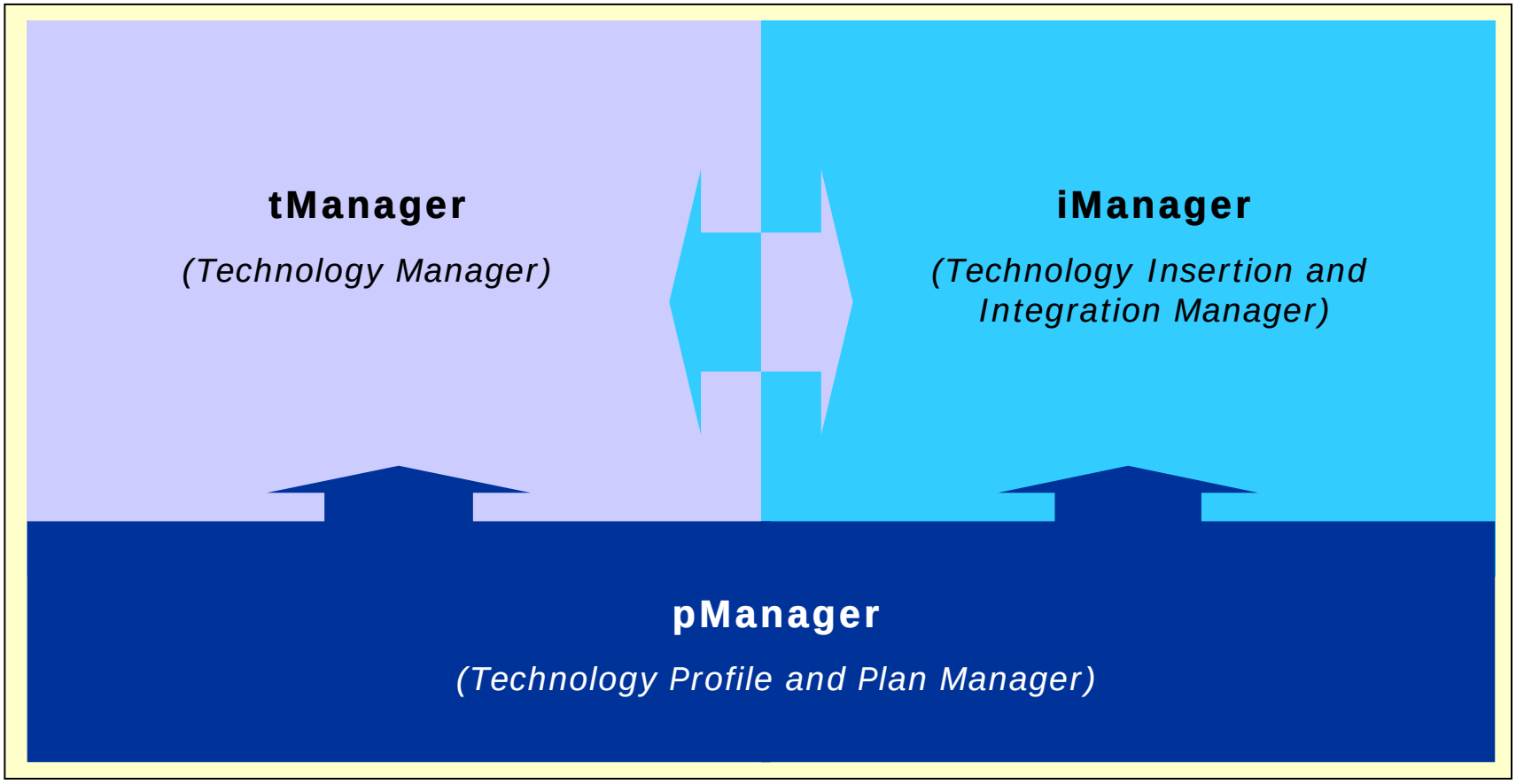
# TechIP Methodology

The TechIP methodology provides a framework for the management of technology through SoS Life Cycle.



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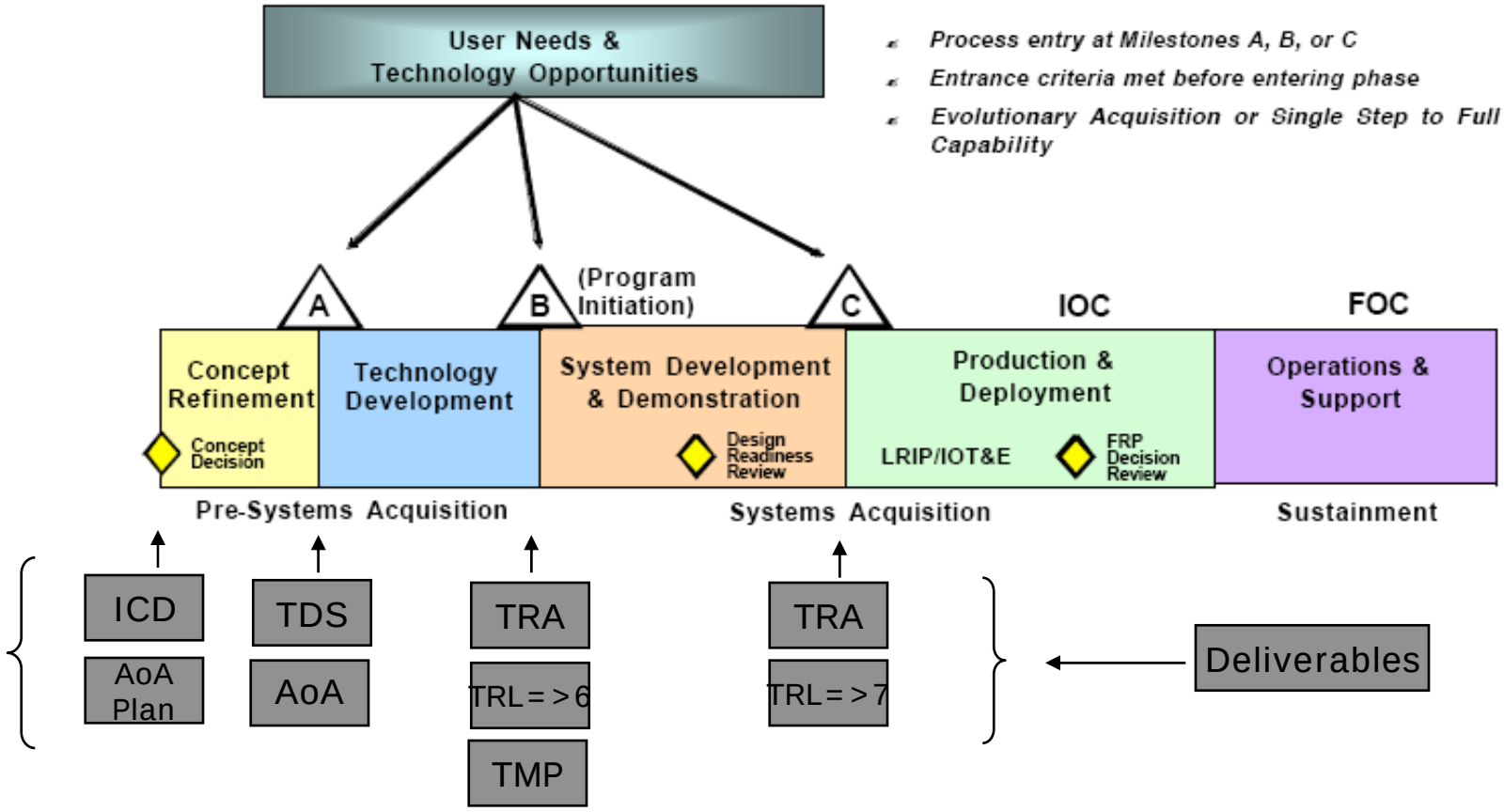
# tManager: DoD Framework and Deliverables

Technology Identification, Due Diligence, Risk Management, Insertion, Integration, Collaboration and Planning processes cover complete System-of-Systems (SoS) Life Cycle.

**Defense Acquisition Management Framework**
**(Source: DoDI 5000.2)**

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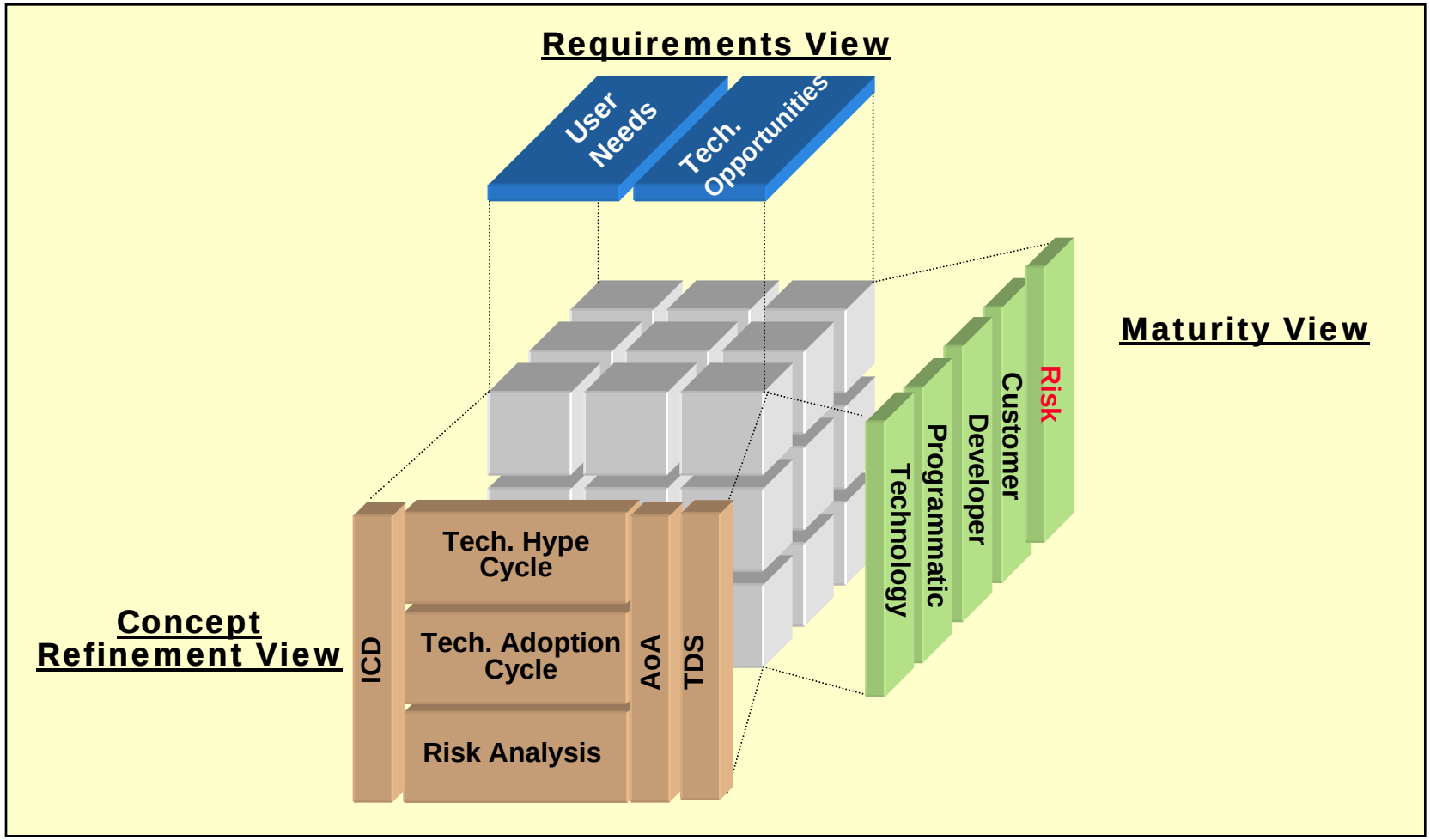
# tManager: Technology Selection

Technology selection comprises of reviewing user needs and technology opportunities (**Requirements View**), identifying Critical Technology Elements (**Concept Refinement View**) and conducting maturity analysis (**Maturity View**).



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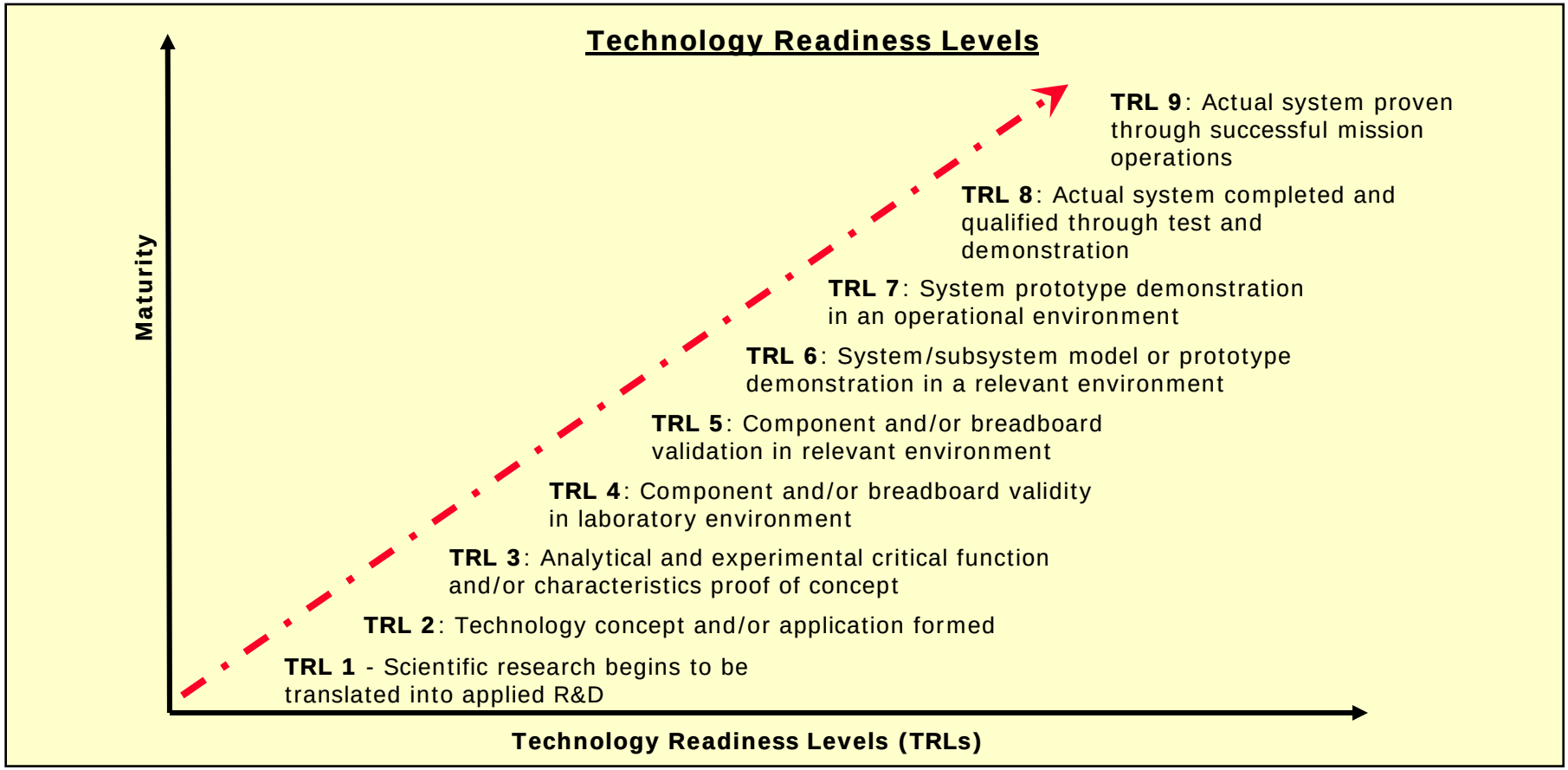
# Maturity Classification: Current TRLs

NASA developed matrix to classify technology maturity



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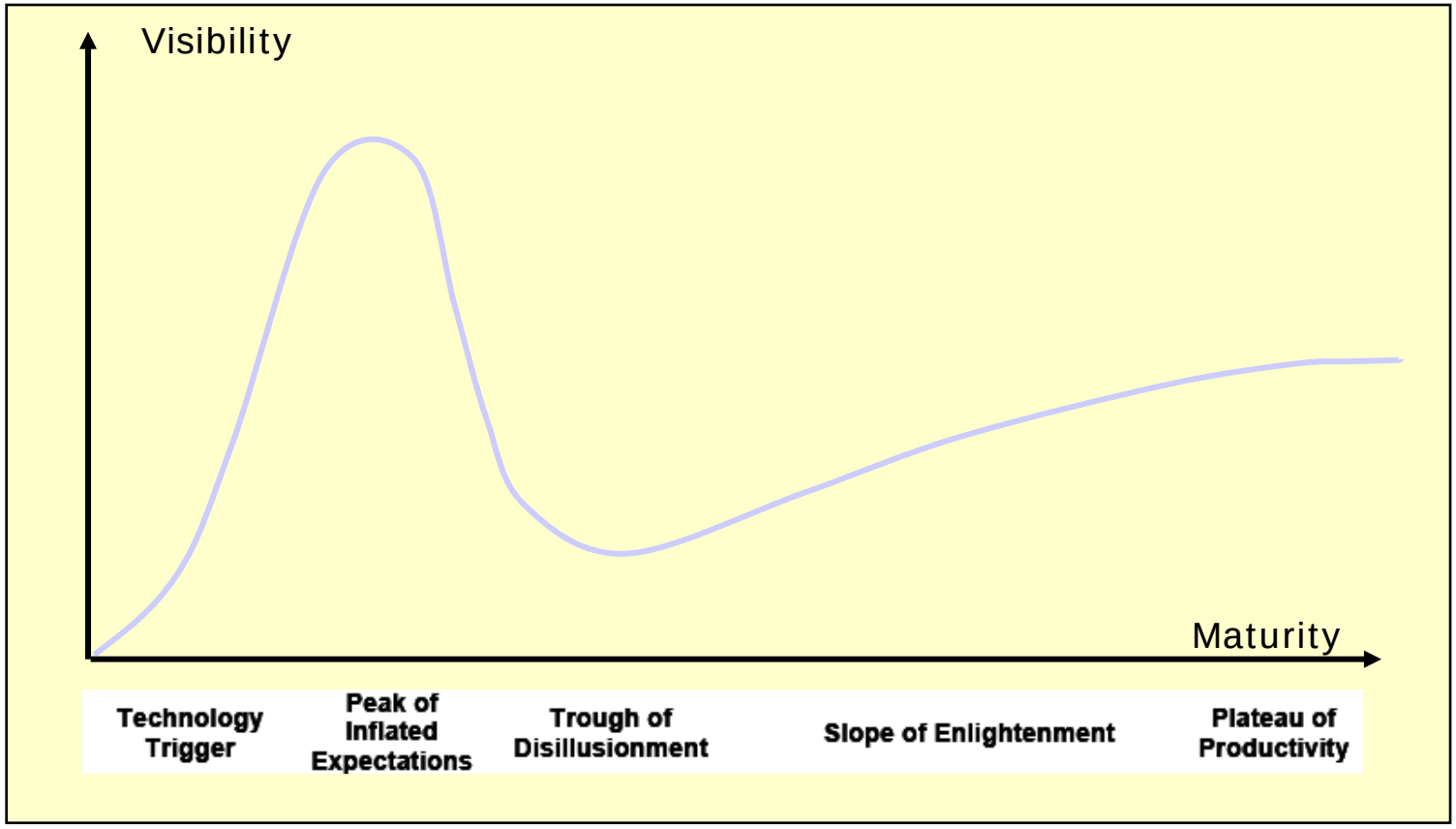
# Hype Cycle: Introduction

A Hype Cycle provides a snapshot of technologies, identifying which technologies are hyped, suffering disillusionment, and stable enough to study deployment.




**Source: Gartner, Hype Cycle for Emerging Technologies 2005**



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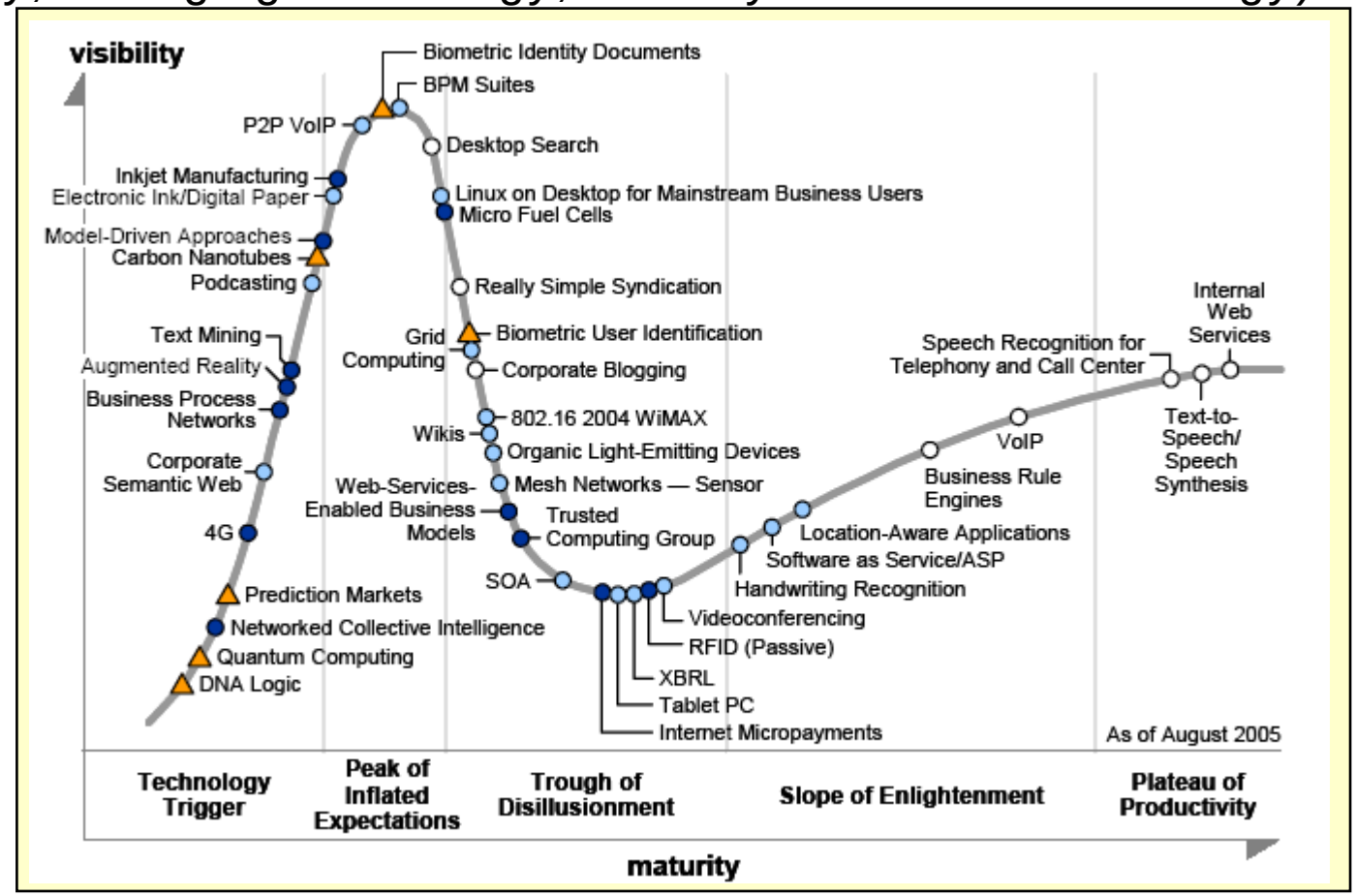
# Hype Cycle: Gartner's Emerging Technology Elements

Hype Cycles are developed for different domains (e.g: government technology, emerging technology, security assurance technology)




**Source: Gartner, Hype Cycle for Emerging Technologies 2005**



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# Hype Cycle: How to Use

Early Identification of Emerging Technology: Cuts through hypes and buzzwords

- **Develop:**
  - Generic hype cycles for Government-wide (DoD/FFRDC) and Commercial (Contractor, OEMs) Academic (University, Independent research) Technology Elements
  - Develop SoS Specific or System Specific Technology Elements Hype Cycle
- **Analyze:**
  - What are the core technologies? What innovative technologies are available? What are the migration (existing to proposed technology) strategies?
  - Don't get caught up in Hype / Don't ignore unfashionable technology
  - Develop technology road map
- **Select:**
  - Use the analysis as an input to TDS

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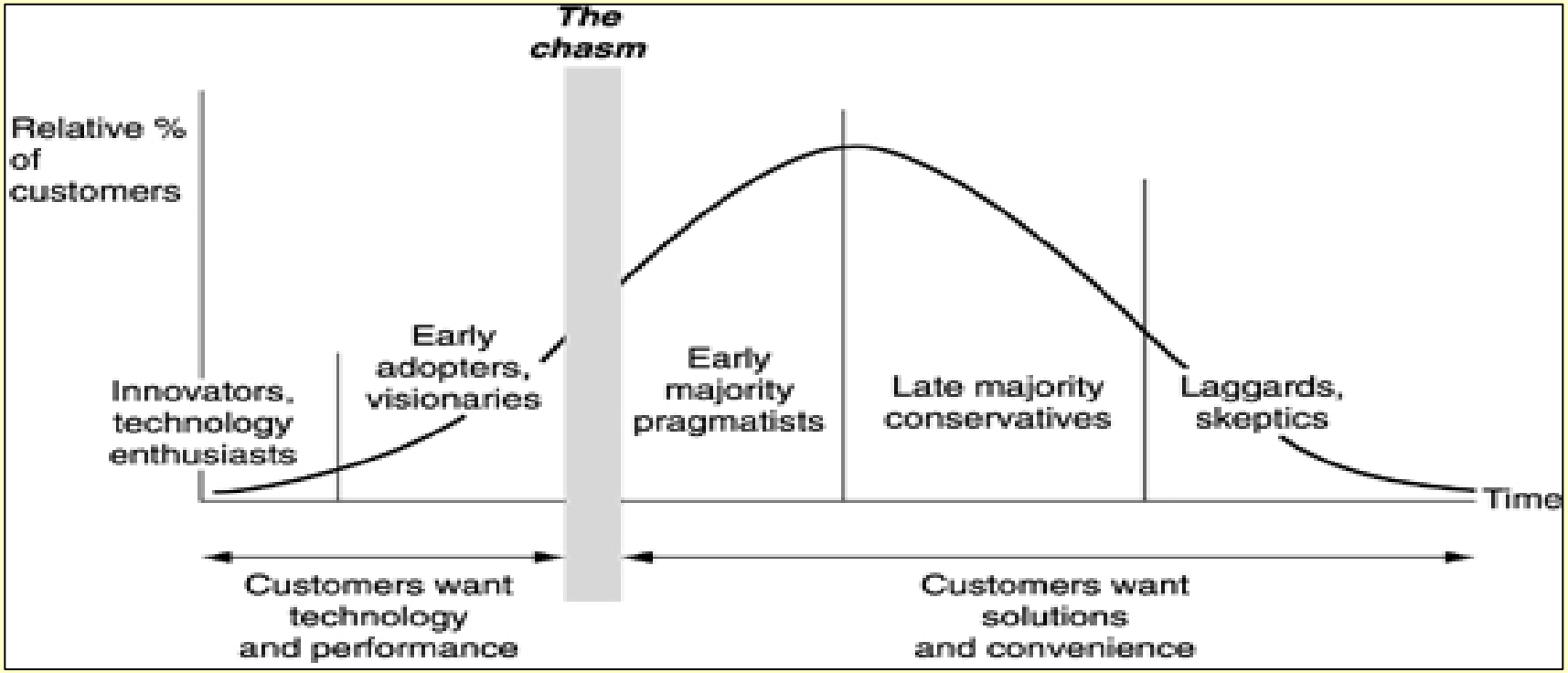
# Technology Adoption Life Cycle

Technology fight for survival, evolve, and undergo their own characteristic life cycle.




Source: Norman (1998: The Invisible Computer)



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# Adoption Cycle: How to Use

Why good technology fail; inferior technology succeed

- **Develop:**
  - Link Technology Maturity to different User types.
    - Early stages – Technology dominates
    - Later stages – Usability, convenience and value
  - Technology insertion/integration strategies for different technology maturity levels
- **Analyze:**
  - Understand Different User Needs and Position Technology selection and budget to meet their requirements and perceptions.
  - Difficulties in adopting disruptive technology
  - Link demonstrations and implementations to appropriate User types.
  - Innovation in Processes to support selected Technology
- **Select:**
  - Use the analysis as an input to TDS



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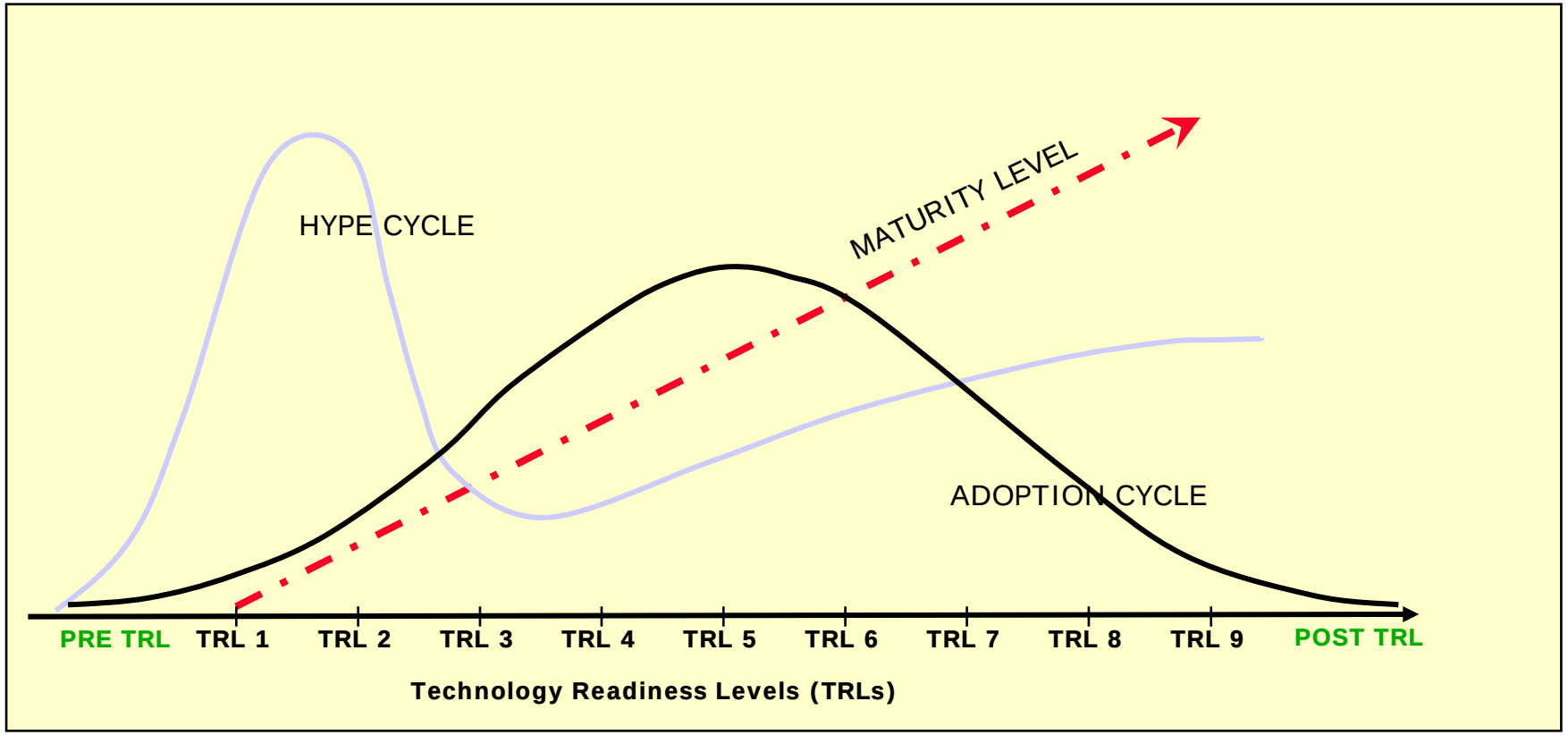
# tManager: Technology Manager

Maturity Levels should be linked to related technology evaluation cycles



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# tManager: How to Use

- **Develop:**
  - Pre-TRL activities
  - Post-TRL activities
- **Analyze:**
  - Technology Cycle results
  - Contractor incentives (and associated performance requirements) to maintain and implement “Live TDS” through complete SoS/System life cycle
- **Select:**
  - Incorporate in to TDS



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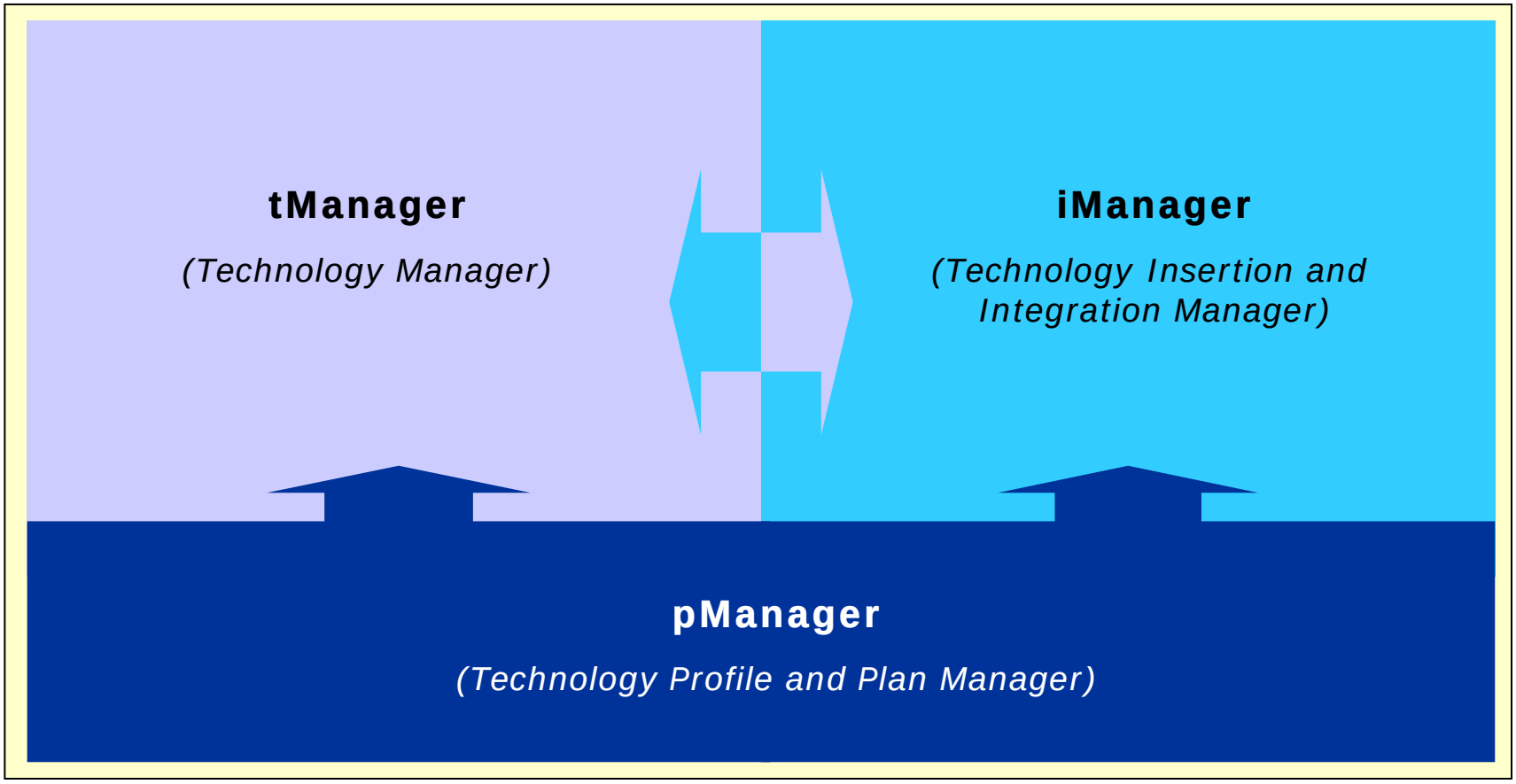
# TechIP Methodology

The TechIP methodology provides a framework for the management of technology through its lifecycle. TechIP consists of three components which are tManager, iManager & pManager



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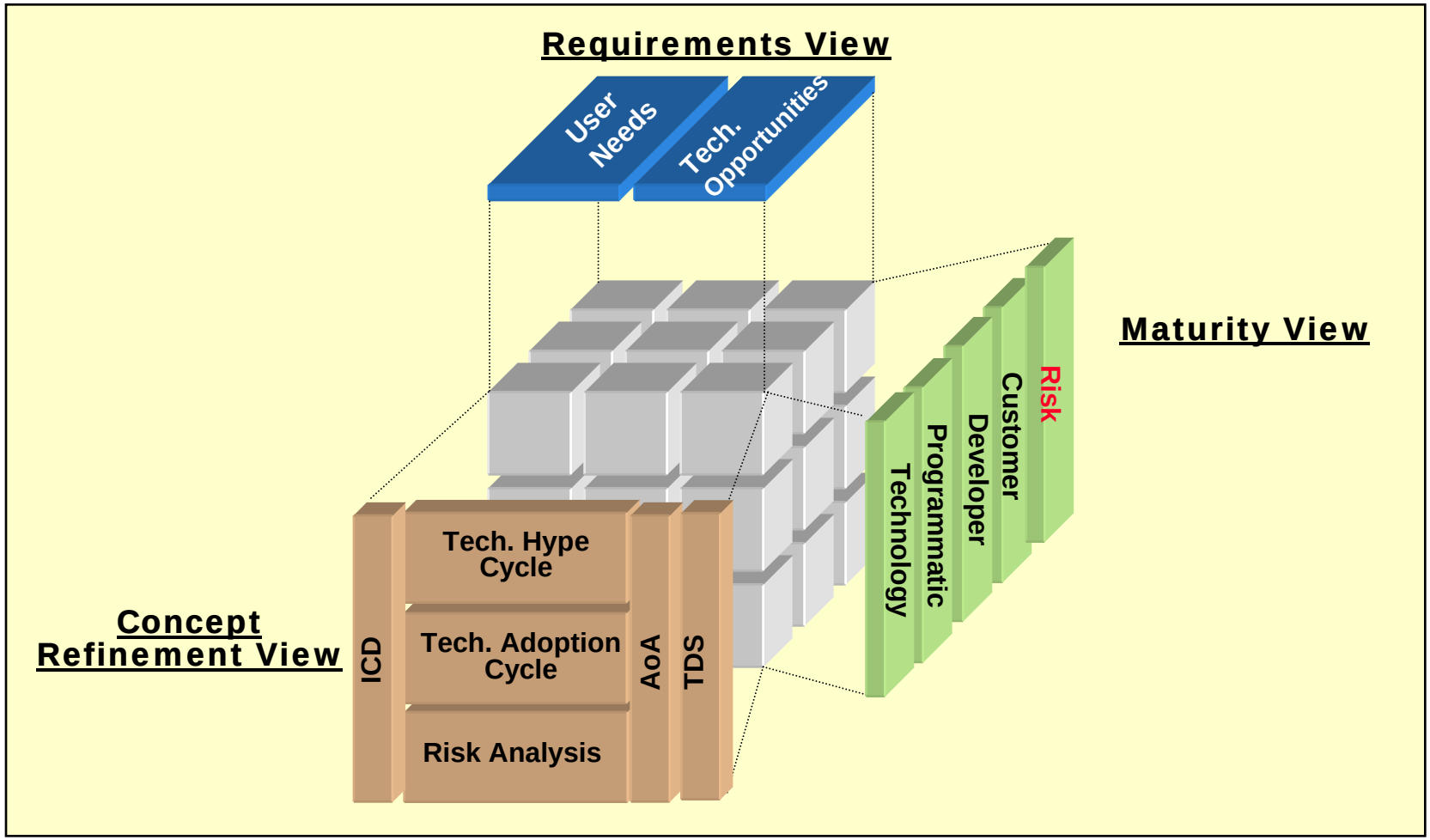




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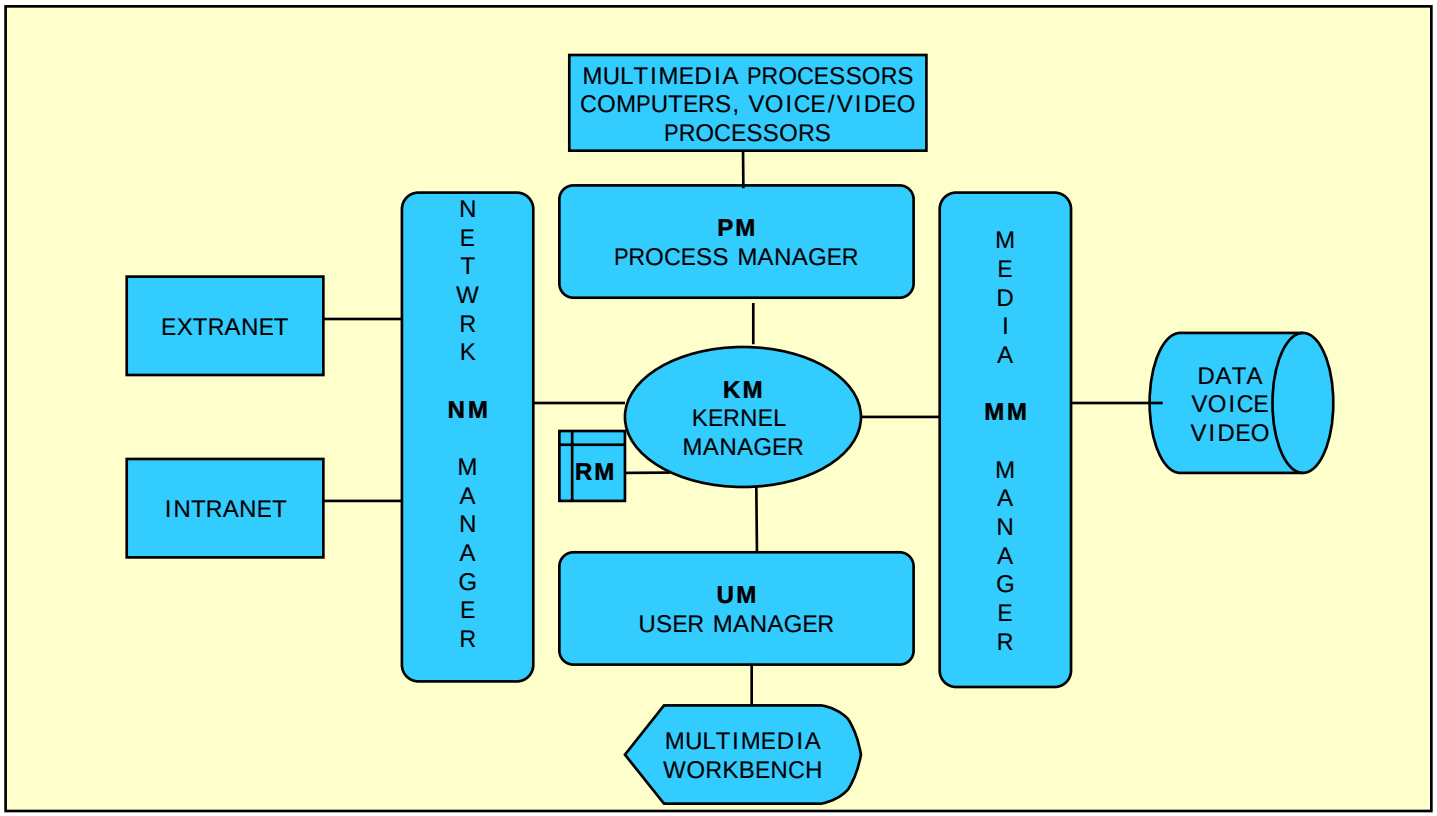
# iManager : Overview

Generic Model (IT System) to map Critical Technology Elements (CTEs) derived TDS into SoS



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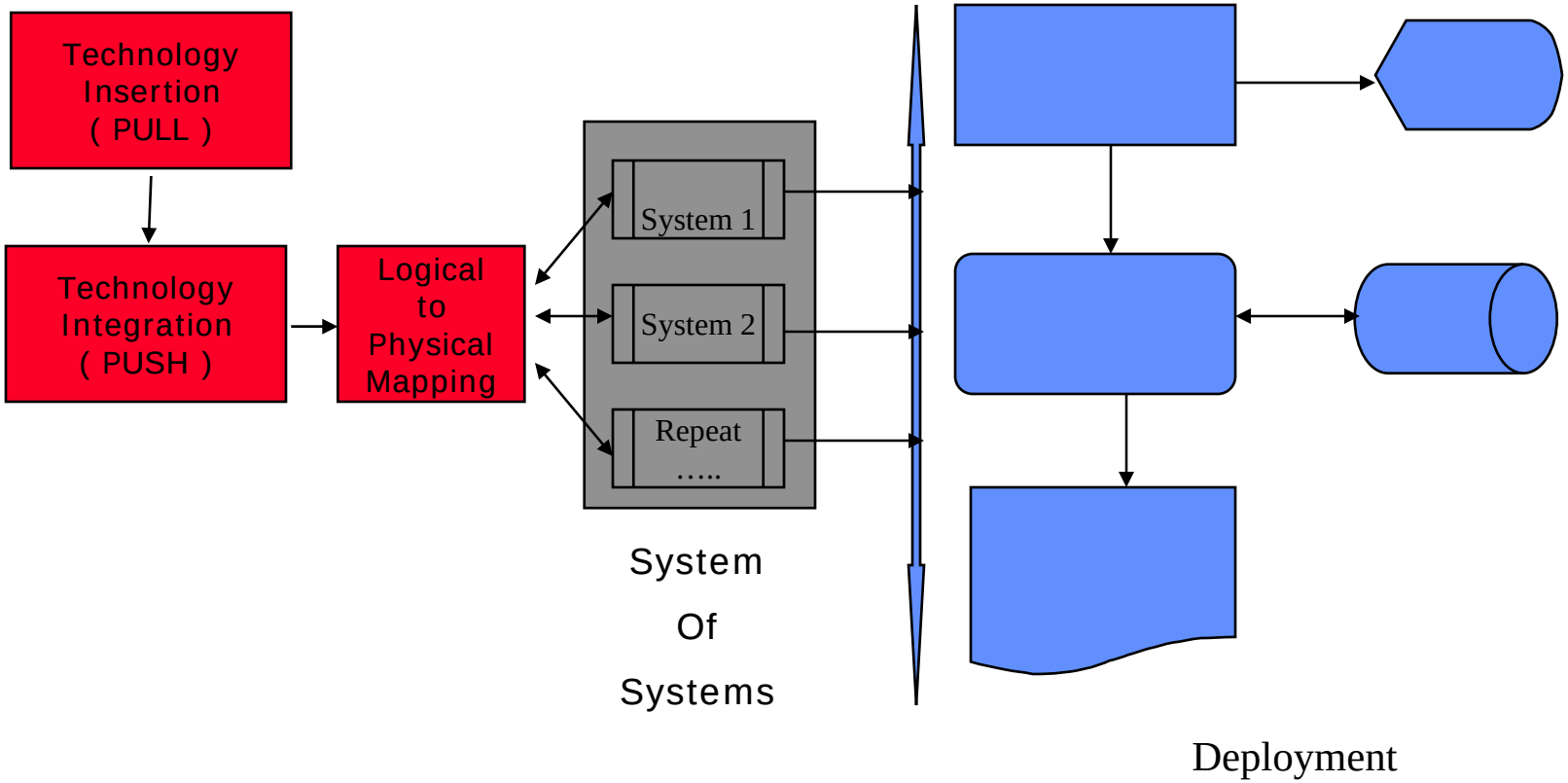
# iManager: Technology Insertion & Integration Activities

Create a Technology specific iManager model by PULLing CTEs from tManager; create iManager models for each system component of SoS, and integrate these CTEs in to SoS by PUSHing into individual systems.



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# pManager : Overview

The objective of pManager (which is a set of processes and software tools) is to manage the technologies identified by the tManager and iManager components of TechIP.

| | |
|---|---|
| **Technology Profile** | • Metadata (definitions) of CTEs, systems, subsystems, etc.<br>• Live Technology life cycles |
| **Technology Plans** | • Live TDS<br>• Technology Roadmaps<br>• Technology Migration Plans<br>• Technology Maturation Plans |
| **Management & Collaboration** | • Forrester Value Network<br>• Collaboration Platform<br>• EA/SD Procedures<br>• CMMI |
| **Tools** | • AFRL/Bill Nolte's TRL Calculator<br>• SEI (IDEAL – based New technology Rollout)<br>• Technology Portal<br>• Modeling and Simulation |



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# Profile

**Has Patel**

- Founded Infologic, Inc.
- Previous experience:
  - Bell Labs
  - Software Company
  - Various Industries
- Research Interests:
  - System Architecture
  - Technology Insertion
  - Emerging Technologies
- Education: MS/BS

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# Conclusions

I. Role of Technology Cycles (Hype Cycle and Adoption Cycles ) in identifying technologies for a System or Project

II. Introduce a methodology, called TechIP (Technology Insertion Plan) which can be sued for through the complete life cycle of a System or Project to identify, select, insert, integrate and manage technologies.

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- pManager (Plan Manager)



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# Technology Evaluation Cycles and Maturity Assessment

*??? !!! ???*

Any Questions, Comments,
Disagreements and Constructive Suggestions

**Has Patel**
**Infologic, Inc.**
**has.patel@infologic.com**
**(888) 325 0500 Ext. 100**